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Dual Function Retainer for a Ratcheting Wrench

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Background of the Invention

1. Field of the Invention

4 The present invention relates to a dual function retainer for a ratcheting
5 wrench of the type receiving a fastener-driving member therein for driving a
6 fastener such as a screw, bolt, or nut.

2. Description of the Related Art

8 Ratcheting wrenches have been widely used for tightening/loosening
9 fasteners such as screws, bolts, and nuts, and there are a wide variety of types of
10 ratcheting wrenches.

11 Fig. 8 of the drawings illustrates a conventional ratcheting wrench 1 of
12 the type including a handle 9 and a head 2 in the form of a box end. A gear wheel
13 3 is rotatably held in the head 2 and includes a through-hole 4 configured to
14 releasably hold a shank of a screwdriver that has a bit 8 for driving a fastener. A
15 retainer 5 such as a C-clip is provided between the gear wheel 3 and the head 2
16 for rotatably holding the gear wheel 3 in the head 2. An annular groove 6 is
17 defined in an inner periphery delimiting the through-hole 4, and a retainer 7 such
18 as a C-clip is mounted in the annular groove 6 for holding the screwdriver.
19 However, when tightening the fastener, the user has to repeatedly moving the
20 handle 9 back and forth many times, which is time-consuming and laborious.
21 Further, the screwdriver shank is apt to displace relative to the gear wheel 3 and
22 thus may be disengaged from the through-hole 4 of the head 2, as there is no
23 member for retaining the screwdriver shank in place. Further, formation of the
24 annular groove 6 for receiving the retainer 7 and formation of the annular groove

1 in the inner periphery of the head 2 for receiving the retainer 5 are difficult and
2 thus increase the cost.

3 **Summary of the Invention**

4 An object of the present invention is to provide a ratcheting wrench
5 having a dual function retainer for rotatably holding a drive member in a head of
6 the ratcheting wrench and for securely, releasably holding a fastener-driving
7 member received in the drive member.

8 Another object of the present invention is to provide a ratcheting wrench
9 having a drive member that securely receives a fastener-driving member therein
10 and that has a flange allowing a user to quickly turn the drive member together
11 with the fastener-driving member to quickly drive a fastener and allowing the user
12 to finely turn the drive member and the fastener-driving member when desired.

13 A ratcheting wrench in accordance with the present invention comprises:
14 a handle having an end, the end of the handle having a compartment;
15 a head extending from the end of the handle and having a hole
16 communicated with the compartment of the handle;
17 a drive member rotatably mounted in the hole of the head, the drive
18 member having an end located outside the head, the drive member including a
19 hole for engaging with a fastener-driving member, allowing joint rotation of the
20 drive member and the fastener-driving member when the drive member is turned,
21 the drive member further including a plurality of teeth on an outer periphery
22 thereof, two annularly spaced slots being defined in the end of the drive member
23 and communicating the hole of the drive member with an exterior, the drive
24 member further including a stop on an inner periphery delimiting the hole of the
25 drive member and opposite to the end of the drive member outside the head, the

1 stop preventing the fastener-driving member from disengaging from the hole of
2 the drive member;

3 a retainer mounted around the end of the drive member, the retainer
4 having two resilient portions extending into the hole of the drive member via the
5 slots for rotatably holding the drive member in the hole of the head and for
6 securely, releasably holding the fastener-driving member in the hole of the drive
7 member; and

8 a ratcheting mechanism mounted in the compartment of the handle and
9 engaged with the teeth of the drive member, the ratcheting mechanism allowing
10 the handle to selectively move in a ratcheting direction for tightening/loosening a
11 fastener engaged with the fastener-driving member and in a free turning direction
12 reverse to the ratcheting direction in which the fastener engaged with the
13 fastener-driving member is not turned.

14 In an embodiment of the invention, the retainer is a substantially
15 U-shaped metal wire and includes an intermediate portion and two resilient legs
16 respectively extending from two ends of the intermediate portion. Each resilient
17 leg has a rectilinear section that partially extends into the hole of the drive
18 member via an associated one of the slots. Further, the retainer includes at least
19 two exposed sections outside the drive member. Preferably, the slots of the drive
20 member are diametrically opposed to each other. Preferably, the drive member
21 further includes a flange formed on an outer periphery of another end thereof. The
22 flange is located outside the head for manual rotation of the drive member.
23 Preferably, the flange has an embossed outer periphery for easy grasp and turning
24 of the drive member. Preferably, the flange abuts against an end face of the head.

25 The drive member of the ratcheting wrench in accordance with the
26 present invention can be turned quickly such that the time for

1 tightening/loosening a fastener can be significantly reduced. Further, the
2 fastener-driving member is securely retained in place by the retainer, and the
3 fastener-driving member is prevented from disengaging from the drive member
4 by the stop. Further, the retainer provides two functions, one for rotatably holding
5 the drive member in the hole of the head, and the other for securely, releasably
6 holding the fastener-driving member in the hole of the drive member.

7 Other objects, advantages, and novel features of the invention will
8 become more apparent from the following detailed description when taken in
9 conjunction with the accompanying drawings.

10 **Brief Description of the Drawings**

11 Fig. 1 is a perspective view of a first embodiment of a ratcheting wrench
12 in accordance with the present invention.

13 Fig. 2 is an exploded perspective view of the ratcheting wrench in
14 accordance with the present invention.

15 Fig. 3 is a sectional view of the ratcheting wrench in accordance with the
16 present invention.

17 Fig. 3A is a sectional view taken along plane A-A in Fig. 1.

18 Fig. 3B is a sectional view similar to Fig. 3A, illustrating operation of the
19 ratcheting wrench in a reverse direction.

20 Fig. 4 is a sectional view taken along plane 4-4 in Fig. 3.

21 Fig. 5 is a sectional view similar to Fig. 3, illustrating use of the
22 ratcheting wrench in accordance with the present invention.

23 Fig. 6 is a perspective view illustrating quick tightening operation of the
24 ratcheting wrench in accordance with the present invention.

25 Fig. 7 is a perspective view illustrating final tightening operation
26 procedure of the ratcheting wrench in accordance with the present invention.

1 Fig. 8 is a schematic side view, partly sectioned, of a conventional
2 ratcheting wrench.

3 **Detailed Description of the Preferred Embodiment**

4 Referring to Figs. 1 through 3, a ratcheting wrench in accordance with the
5 present invention is designated by 10 and generally comprises a handle 12 and a
6 head 11 extending from an end of the handle 12. The head 11 is in the form of a
7 box end and includes a hole 13. A compartment 14 is defined in the end of the
8 handle 12 and communicated with the hole 13 of the head 11. In an embodiment
9 of the invention, a ratcheting mechanism is provided in the compartment 14 and
10 includes a pawl 40. An opening 15 is defined in a side (upper side in Fig. 2) of the
11 end of the handle 12 and communicated with the compartment 14.

12 A drive member 20 is rotatably held in the hole 13 of the head 11. The
13 drive member 20 includes a hole 22 for engaging with a fastener-driving member
14 60 (e.g., a screwdriver), and a plurality of teeth 21 are defined in an outer
15 periphery of the drive member 20. Two annularly spaced cutouts or slots 25 are
16 defined in an end of the drive member 20 that is located outside the head 11 when
17 the drive member 20 is received in the hole 13 of the head 11. The slots 25
18 communicate the hole 22 of the drive member 20 with the exterior and are
19 preferably diametrically opposed. The other end of the drive member 20 includes
20 an operative portion that is substantially a disc or flange 23 abutting against an
21 end face of the head 11, as shown in Fig. 3. Preferably, the flange 23 has an
22 embossed outer periphery 231 to increase friction, allowing easy turning of the
23 drive member 20 by grasping and turning the flange 23. Further, still referring to
24 Fig. 3, a stop 24 (e.g., an inner flange) projects inwardly from an end of the inner
25 periphery delimiting the hole 13 of the drive member 20 and is located in a
26 position preferably beyond the hole 13 of the head 11.

1 A retainer 30 is provided for rotatably holding the drive member 20 in the
2 head 11 and for securely, releasably holding the fastener-driving member 60 in the
3 hole 22 of the drive member 20. In this embodiment, the retainer 30 is a
4 substantially U-shaped metal wire and includes an intermediate portion 33 and
5 two substantially L-shaped resilient legs 31 respectively extending from two ends
6 of the intermediate portion 33. As illustrated in Fig. 3, the retainer 30 is mounted
7 around the lower end of the drive member 20, with the rectilinear longer sections
8 of the resilient legs 31 of the retainer 30 partially protruding into the hole 22 of
9 the drive member 20 via the slots 25. The retainer 30 has four exposed sections 32
10 outside the drive member 20, best shown in Fig. 4. Thus, the drive member 20 is
11 rotatably retained in the hole 13 of the head 11.

12 The pawl 40 has a plurality of teeth 41 on a side thereof for releasably
13 engaging with the teeth 21 of the drive member 20. A recessed portion 44 is
14 formed on the other side of the pawl 40 and includes two inclined faces 441 and
15 442 spaced apart by an intermediate section (not labeled) therebetween. The pawl
16 40 further includes two abutting faces 42 and 43 for abutting against a wall
17 delimiting the compartment 14 of the handle 12 when proceeding ratcheting
18 operation for tightening/loosening a fastener 70.

19 A switch member 50 is provided for controlling position of the pawl 40 in
20 the compartment 14. The switch member 50 includes a substantially cylindrical
21 body 57 that is rotatably received in the compartment 14 and a turn piece 51 that
22 extends outward from an end of the cylindrical body 57 to a position beyond the
23 handle 12 via the opening 15 of the handle 12 for manual operation. The
24 cylindrical body 57 includes a receptacle 52 for receiving an elastic element 56
25 and a pressing member 55 having a receptacle 551 defined therein. As illustrated
26 in Fig. 3, the pressing member 55 is partially received in the receptacle 52 of the

1 cylindrical body 57, with an end of the elastic element 56 attached to an end wall
2 delimiting the receptacle 52 of the cylindrical body 57 and with the other end of
3 the elastic element 56 attached to an end wall delimiting the receptacle 551 of the
4 pressing member 55. The pressing member 55 is normally biased by the elastic
5 element 56 to press against one of the inclined faces 441 and 442 of the pawl 44
6 (e.g., the inclined face 442, see Fig. 3A), thereby urging the teeth 41 of the pawl
7 40 to engage with the teeth 21 of the drive member 20. In this case, as shown in
8 Fig. 3A, the wrench allows ratcheting operation (i.e., tightening or loosening of a
9 fastener) in the counterclockwise direction and allows free rotation in the
10 clockwise direction (i.e., the fastener is not turned when the handle 12 is turned
11 clockwise). It is noted that the abutting face 43 of the pawl 40 abuts a wall
12 delimiting the compartment 14 of the handle 12 when the drive member 20 is
13 turned in the ratcheting direction.

14 When the turn piece 51 of the switch member 50 is turned, the pressing
15 member 55 is moved from the inclined face 442 to the other inclined face 441.
16 The teeth 41 of the pawl 40 engage with the teeth 21 of the drive member 20
17 under the action of the elastic element 56. In this case, the wrench allows
18 ratcheting operation in the clockwise direction and allows free rotation in the
19 counterclockwise direction (i.e., the fastener is not turned when the handle 12 is
20 turned counterclockwise). It is noted that the abutting face 42 of the pawl 40 abuts
21 the wall delimiting the compartment 14 of the handle 12 when the drive member
22 20 is turned in the ratcheting direction. The cylindrical body 57 further includes
23 two engaging faces or portions 53 and 54 one of which presses against an
24 associated one of the inclined faces 441 and 442 of the pawl 44, as shown in Figs.
25 3A and 3B. This provides a more reliable support for the pawl 40.

1 Referring to Fig. 5, in use, a portion of a fastener-driving member, e.g., a
2 shank 61 of a screwdriver 60 is inserted into the drive member 20 until an end
3 face of the shank 61 is stopped by the stop 24. The shank 61 of the screwdriver 60
4 is retained in the engaging portion 22 of the drive member 20 by the legs 31 of the
5 retainer 30 that extend into the hole 22 of the drive member 20 through the slots
6 25 in the drive member 20. When tightening a fastener 70, referring to Fig. 6, the
7 user may grasp and turn the flange 23 rapidly, which causes rapid rotation of the
8 drive member 20 and the shank 61 of the screwdriver 60. Thus, the fastener 70 is
9 quickly turned in the tightening direction until a relatively large force is required
10 for securely tightening the fastener 70. This is because the force required for
11 turning the drive member 20 is smaller at the first stage of tightening the fastener
12 70. Another reason allowing rapid turning of the drive member 20 is that the
13 flange 23 has an outer diameter that is much smaller when compared to the arm of
14 force for turning the handle 12. Thus, the time for turning the fastener 70 to an
15 almost tightened position is much shorter when compared to the use of the handle
16 12.

17 Referring to Fig. 7, when the fastener 70 is turned to the almost tightened
18 position, the user may use the handle 12 to proceed with firm, reliable tightening
19 of the fastener 70, as the arm of force is greater. Thus, the fastener 70 can be
20 tightened in a rapid and reliable manner. Of course, the time for loosening the
21 fastener 70 can be shortened. It can be achieved by firstly loosening the fastener
22 70 by turning the handle 12 to a slightly loosened position and then loosening the
23 fastener 70 by turning the flange 23 of the drive member 20 with the fingers of
24 the user. Further, the user may manually turn the flange 23 of the drive member
25 20 through a relatively small angle to thereby finely adjust the angular position of

1 the drive member 20 and the shank 61 of the screwdriver 60. This allows the user
2 to finely adjust the tightening force for the fastener 70.

3 It is noted that the ratcheting mechanism and the switch member 50 are
4 not limited to those disclosed herein and shown in the accompanying drawings.
5 They can be replaced with any other structures allowing reversible or irreversible
6 ratcheting operation. The “fastener-driving member” as used herein is not limited
7 to the whole tool. Namely, the “fastener-driving member” may be a whole
8 screwdriver or the like, a screwdriver shank with a bit, or a screwdriver bit. Of
9 course, other member that serves the function of driving fasteners can be used as
10 the fastener-driving member without departing from the scope of the invention.

11 According to the above description, it is appreciated that the drive
12 member 20 of the ratcheting wrench in accordance with the present invention can
13 be turned quickly such that the time for tightening/loosening a fastener can be
14 significantly reduced. Further, the tightening force for the fastener can be finely
15 adjusted. These advantages are provided by the flange 23 on an end of the drive
16 member 20. Further, the fastener-driving member 60 is securely retained in place
17 by the retainer 30, and the fastener-driving member 60 is prevented from
18 disengaging from the drive member 20 by a stop 24. Further, sliding movement of
19 the shank 61 of the screwdriver 60 into the hole 22 of the drive member 20 is
20 smoother when compared to conventional designs. Further, the retainer 30
21 provides two functions, one for rotatably holding the drive member 20 in the hole
22 13 of the head 11, and the other for securely, releasably holding the
23 fastener-driving member 60 in the hole 22 of the drive member 20. The overall
24 cost for manufacturing the ratcheting wrench in accordance with the present
25 invention is lower than conventional designs, as only one retainer is used and the

1 assembling procedure is easier for the ratcheting wrench in accordance with the
2 present invention.

3 Although the invention has been explained in relation to its preferred
4 embodiment, it is to be understood that many other possible modifications and
5 variations can be made without departing from the scope of the invention as
6 hereinafter claimed.